FOSSIL PLANTS FROM THE NARRABEEN STAGE OF THE HAWKESBURY SERIES.

By A. B. Walkom, D.Sc.

(Plates xxiv-xxxi, and one Text-figure.)

[Read 24th June, 1925.]

Introduction.

This paper contains the results of the examination of a large number of fossil plants from the Narrabeen Beds, in the collection of the Geological Survey of New South Wales, and a few specimens from the Australian Museum Collection, and I have to express my appreciation of the opportunity afforded me of studying these interesting collections. The figured specimens, with the exception of *Taeniopteris triassica* (Text-fig. 1), are in the collection of the Geological Survey of New South Wales.

The specimens examined were in the great majority collected by Mr. B. Dunstan, F.G.S., Chief Government Geologist of Queensland, while Lecturer in Geology at the Technical College, Sydney. Mr. Dunstan collected extensively from the beds at Turrimetta Head, a horizon approximately 150 feet below the base of the Hawkesbury Stage. Valuable additions to the collection in the Mining Museum were made by Mr. C. A. Sussmilch, F.G.S., Principal, Technical College, Newcastle.

The Upper Coal Measures (Permian) in New South Wales are followed, usually without apparent stratigraphical break, by the Hawkesbury Series which consists of three stages, Narrabeen, Hawkesbury Sandstone and Wianamatta, the Narrabeen Stage being the lowest.

The Narrabeen Stage has a maximum thickness of about 1,750 feet and consists mainly of fine-grained sandstones and sandy shales. The upper portion of the stage is formed by a thickness of about 130 feet of red and purple shales which serve to mark a conspicuous horizon dividing the Narrabeen Stage from the Hawkesbury Sandstone Stage.

The roof of the Bulli Coal Seam has been regarded as the upper limit of the Upper Coal Measures, and from the strata within a few feet above this seam a small flora has been described (Dun, 1910, 1911), including the following species:—

Glossopteris Browniana.

Schizoneura gondwanensis (= *S. australis*).

Cladophlebis cf. *Roylei.*

Rhipidopsis ginkgoides var. *Sussmilchi.*

Taeniopteris cf. *McClellandi.*

This small collection of species is obviously more closely related to the Permian flora than to the typical Mesozoic flora which appears higher up in the Narrabeen Stage, and is to be regarded as a remnant of the Glossopteris flora.

Although fossil plants are very abundant at certain horizons in the Narrabeen Stage and have been collected for many years, no description of any of the

collections has been published. Mr. W. S. Dun prepared lists of the plants determined from the different Stages of the Hawkesbury Series, and these lists were published in the account of the Western Coalfield (Carne, 1908, p. 42). Mr. Dun very kindly handed over to me, for examination, the collections and also the drawings which had been prepared for him by Mr. F. R. Leggatt and I have to express my gratitude to him for his generosity in this respect. The results of my examination confirm the determinations made by Mr. Dun as contained in the lists prepared by him.

The late R. Etheridge, Jr., described examples of *Schizoneura australis* (= *S. gondwanensis* Feistmantel) from olive-green shales of the Narrabeen Stage at 1,274 feet 6 inches in the Cremorne Bore (Rec. Geol. Surv. N.S.W., iv (1), p. 32), and a further specimen with fructification from 2,870 feet in the Sydney Harbour Colliery Shaft at Balmain (ibid., vii (3), p. 234). He also described a specimen from 1,410 feet to 1,417 feet 6 inches in the Cremorne Bore as *Sagenopteris salisburioides* R. M. Johnston (ibid., iv (1), p. 34).

The following is a list of the species described from the collection under examination:—

Phyllotheca australis Brongn.
Coniopteris sp., cf. *lobata* (Oldham).
Fern stems (? Osmundaceae).
Cladophlebis sp. (fertile).
? *Cladophlebis* sp. (sterile).
Thinnfeldia Feistmanteli Johnston.
Thinnfeldia lancifolia (Morris).
Thinnfeldia narrabeenensis Dun.
? *Sphenopteris* sp.
Taeniopteris Tenison-Woodsi (?) Etheridge Jr.
Taeniopteris crassinervis Feistmantel.
Taeniopteris triassica, n. sp.
Taeniopteris wianamattae (Feistmantel).
Williamsonia sp. (flowers).
Williamsonia sp. (stems).
Ginkgoites sp.
? *Rhipidopsis narrabeenensis*, n. sp.
Brachyphyllum angustum, n. sp.
Araucarites sydneyensis, n. sp.
Carpolithus sp.

The specimens have mostly been obtained from the shales about 6-8 feet above high-water mark at Turrimetta Head, just to the north of Narrabeen. The horizon of these shales is about 150 feet below the top of the Narrabeen Stage.

The result of the examination of this flora of the Narrabeen Stage is somewhat disappointing to one who knows the abundance of plants on some horizons. There is, however, some satisfaction in the knowledge that the descriptions herein will form a basis for future work as well as for future collecting, for it must be remembered that past collecting has all been without any guide as to which forms were known and which were unknown.

The flora of the Narrabeen Stage should be one of the most interesting of the Australian fossil floras when it is better known, as it is almost certainly of Lower Triassic age and floras of this age are not well known in the Southern Hemisphere. The occurrence of *Glossopteris* and *Schizoneura* in the basal beds shows that the upper Palaeozoic flora had not entirely disappeared at the commencement of the Narrabeen Stage, but these forms did not persist for long and are not known in association with the typical Lower Mesozoic flora in Australia.

Equisetales.

PHYLLOTHECA AUSTRALIS Brongn. Plate xxiv, figs. 1-3.

Phyllotheca australis Brongniart, Prodr. Hist. Veget. foss., 1828, p. 152; Etheridge, Geol. Pal. Qland, 1892, p. 189, Pl. 17, fig. 13.—(For full synonymy *see* Arber, 1905, p. 17.)

Fragments of equisetaceous stems are abundantly represented in the collections, but in only one specimen of those examined are the leaves preserved (Pl. xxiv, fig. 2). This specimen can be referred to *Phyllotheca australis*. The remaining examples are either stem impressions or pith casts, and while, strictly, they should only be determined as *Phyllotheca* sp. or even "Equisetaceous stems," there is every probability that they all represent the one species. Associated with the stems there are some examples of nodal diaphragms, one of them being figured on Plate xxiv, fig. 3.

The question might be raised as to whether any of the stems should be referred to the genus *Schizoneura*, but, in the absence, from the collections examined, of any foliage referable to this genus, and on account of the pith casts and stems being quite unlike any of the stems referred to *Schizoneura* from the Ipswich Series of Queensland, it seems probable that the examples from the Narrabeen Series represent stems of *Phyllotheca*.

Filicales.

Cyatheaceae.

? CONIOPTERIS sp. cf. LOBATA (Oldham). Plate xxix, figs. 4, 6.

Frond bi- (? tri-) pinnate. Ultimate pinnae long, narrow, 4-5 mm. broad, opposite or alternate. Pinnules small, ovate, attached by whole base; median vein present, not persistent to apex, together with several secondary veins which make an acute angle with the median vein, and divide once in their course to the margin.

These specimens appear to be close to those described as *Coniopteris lobata* from the Jurassic rocks of Graham Land by Halle (1913, Pl. 1, fig. 27; Pl. 3, fig. 13; and text-fig. 5). This species has been recorded also from Upper Gondwana rocks of India and from the Rhaetic of Poland.

Osmundaceae.

CLADOPHLEBIS sp. Plate xxiv, fig. 4.

The specimen figured appears to be an example of portion of a fertile frond of a species of *Cladophlebis*, possibly *C. australis*. It is very similar in general appearance to a fertile example of *C. denticulata* figured by Seward (1910, p. 345, fig. 258) from Yorkshire. It is, however, the only specimen of its kind among the collections and, in the absence of preservation of any details of structure, it is not easy to determine its true nature satisfactorily. It is quite different from the fertile specimens referred to *Cladophlebis australis* from the Ipswich Series of Queensland (*see* Walkom, 1917, p. 3, Pl. 7, 8).

? CLADOPHLEBIS sp. Plate xxiv, fig. 5.

Several specimens, very imperfectly preserved, probably represent isolated pinnae of a species of *Cladophlebis*. The pinnae are long, parallel-sided, about 2.6 cm. wide, with pinnules closely-set, opposite or alternate, and making a wide angle with the rachis. The pinnules have a distinct midrib and secondary veins (observed with difficulty in parts of the specimen) which make an acute angle with the midrib, and which divide once (?) in their course.

Thinnfeldieae.

THINNFELDIA FEISTMANTELI Johnston. Plate xxiv, figs. 6-9; Pl. xxv, figs. 1, 2.

(For synonymy *see* Walkom, 1917, p. 17.)

The description of this common Mesozoic species has already been given in a previous paper (Walkom, 1921, p. 9).

The specimens from the Narrabeen Series are typical examples and exhibit considerable variation in size. In some of the smaller examples the pinnules are more pointed than in the larger ones and may even be somewhat falcate. Some of the large specimens show very well the character of the pinnules seated directly on the rachis; those below the point at which the rachis divides are well separated from one another and are contracted at their base.

This species of *Thinnfeldia* seems very close to that figured by Zeiller (1903, Pl. vi-viii) as *Ctenopteris Sarrani*. Seward and Holttum (1921, p. 41) express the opinion that the two are probably specifically distinct; they also suggest that *T. Feistmanteli* would be more appropriately referred to the genus *Ctenopteris* in view of the fact "that the habit of the frond as a whole is recognized as an important character in distinguishing between such genera as Ctenopteris, Thinnfeldia and Ptilozamites." They do not, however, suggest that the other Australian species of *Thinnfeldia*, *T. lancifolia* and *T. odontopteroides*, should also be referred to *Ctenopteris*. The species recently described by me as *Thinnfeldia talbragarensis* (Walkom, 1921, p. 9) forms a connecting link between *T. lancifolia* and *T. Feistmanteli* and, as all four species of *Thinnfeldia* above-mentioned are characterized by their frond habit, in particular by the dichotomous forking of the rachis, it seems to me impossible to separate them generically and I am unable to agree with the suggestion that any one of them should be transferred to *Ctenopteris*.

In the collections there are several specimens like that figured on Plate xxiv, fig. 9. These may be fragments of fertile fronds of *T. Feistmanteli*. They do not show any detail of structure, exhibiting only the distribution of the sori and the shape of the pinna. They agree in these general characters with the specimen figured from the Ipswich Series of Queensland (*see* Walkom, 1917, Pl. 1, fig. 3).

THINNFELDIA LANCIFOLIA (Morris).

Plate xxv, fig. 3; Pl. xxvi, figs. 1-3; Pl. xxvii, figs. 1, 2, 4, 5.

(For synonymy *see* Walkom, 1917, p. 21.)

"Frond divides dichotomously into two linear pinnae which are inclined to one another at an acute angle. Pinnules vary in form with their position; the majority are elongate, tapering, with a rather acute tip, and have a distinct midrib which does not usually persist to the tip of the pinnule. The pinnules on the inner sides of the branches become smaller as the point of branching is approached, and gradually change from elongate acute to a rather ovate semicircular or more or less rhomboidal shape, without a midrib, the veins arising directly from the rachis. The pinnules on the rachis below the junction may be of either type. The venation is alethopteroid, the secondary veins being given off from the midrib at a rather acute angle. In the basal portion of the pinnules some of the veins come direct from the rachis; the pinnules are decurrent and are connected by a narrow lamina along the rachis" (Walkom, 1917).

This species is of common occurrence in the Lower Mesozoic rocks of Australia, and also occurs in the Stormberg Beds of South Africa.

THINNFELDIA NARRABEENENSIS Dun, MS.

Plate xxvi, fig. 4; Pl. xxvii, figs. 3, 6; Pl. xxviii, figs. 1-4.

Frond large, pinnate, dichotomous. Rachis strong, pinnules large, elongate, obtusely pointed, opposite or subopposite, with margins usually entire, occasionally broadly lobed. In the basal portion of the frond the pinnules are modified, being reniform to triangular and somewhat contracted at the base. The elongate pinnules have a prominent midrib, with secondary veins close, slightly curved, and branching. The basal pinnules have venation of the odontopteroid type.

This is a much larger and more robust type than any of the other Australian species of Thinnfeldia. The individual pinnules attain a size of 7.5 cm. long by 2 cm. broad; their form varies somewhat; they may be gradually rounded with blunt apices, or tapering to acute apices.

The species seems to be most closely related to those specimens described as *Danaeopsis Hughesi* from rocks of Rhaetic age in India, South Africa, China, Tonkin and Queensland. From this species it differs in its somewhat smaller size and in the secondary veins being less numerous and not branching as frequently.

Whether the two species should be referred to the same genus is a question about which there is some doubt. No fertile examples of *D. Hughesi* have been found and there does not appear to be strong evidence for referring the species to the Marattiales. The species *T. narrabeenensis* is closely associated with other species of *Thinnfeldia* and is linked with them by its general characters, and there would seem to be no justification for separating it from this genus, unless indeed, all the other Australian species at present referred to this genus are also moved.

It seems possible that the specimens referred to *Danaeopsis Hughesi* may have to be, at some future date, removed to the genus *Thinnfeldia*.

This species differs markedly from *Neuropteridium* in the venation and in the attachment of the pinnules to the rachis.

Filicales incertae sedis.

? SPHENOPTERIS sp. Plate xxix, fig. 5.

The fragment figured on Plate xxix, fig. 5 may be referred, provisionally, to *Sphenopteris*. It is portion of a bipinnate frond, with small pinnules, but no trace of the venation is preserved. In habit it may be compared with such species as *Callipteridium stormbergense* Seward (1903, Pl. viii, fig. 2) from the Stormberg beds of South Africa, and *Scleropteris crassa* Halle (1913, Pl. 4, figs. 4-9) from the Jurassic flora of Graham Land.

? FERN STEMS. Plate xxix, figs. 10, 11.

Several specimens represent plant stems covered with a series of spirally arranged, elongate oval structures which probably represent a crowded mass of leaf-bases. The leaf-bases are roughly 8 mm. in diameter and in one of the specimens they bear small U-shaped scars, which suggest the impression left by the trace of the vascular strand of the petiole in *Osmundites*. It seems probable that these stems are those of a fern, possibly belonging to the Osmundaceae.

TAENIOPTERIS TENISON-WOODSI (?) Etheridge Jr. Plate xxix, fig. 1.

(*See* Walkom, 1917, p. 32.)

The two leaves figured on Plate xxix, fig. 1 resemble *Taeniopteris Tenison-Woodsi* in the size and form of the leaf and also in the venation. The only

difference, a slight one, appears to be that the secondary veins in our examples are slightly curved in their course from midrib to margin whereas in examples of the species previously examined they have been generally straight.

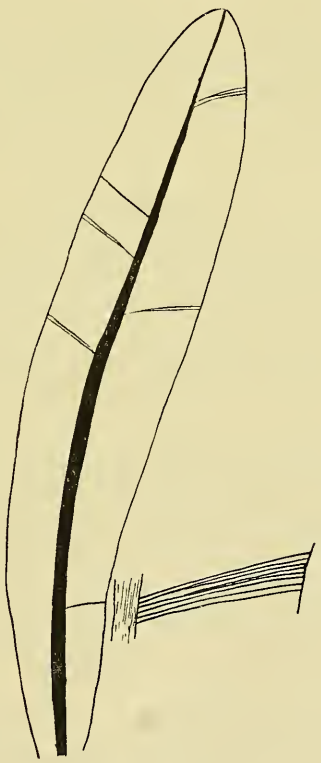
The species has only been recorded in Queensland in beds belonging to the Ipswich Series or its equivalents. A fragment which probably represents the same species has been figured as *T. Carruthersi* from the Stormberg beds of South Africa (Seward, 1903, Pl. viii, fig. 5).

TAENIOPTERIS CRASSINERVIS (?) Feistmantel.
Plate xxix, fig. 2; Pl. xxxi, fig. 12.

Portion of a large *Taeniopteris* is figured on Plate xxix. It agrees with *T. crassinervis* except that the veins are somewhat closer in our specimen. The fragment figured on Plate xxxi, fig. 12 is probably portion of a specimen of the same species. *T. crassinervis* occurs in Queensland Lower Mesozoic rocks and in the Rajmahal Group in India.

TAENIOPTERIS TRIASSICA, n. sp. Text-fig. 1.

In a small collection of plants from the Narrabeen Stage, belonging to the Australian Museum, there are two examples of a *Taeniopteris* different from any



Text-fig. 1. *Taeniopteris triassica*, n. sp. (× ⅔). The veins shown here and there indicate the inclination of the secondary veins to the midrib. A portion is also shown (× 2) to indicate the nature of the venation.

hitherto described from Australia. The most complete of these (No. F 17820) is figured in Text-fig. 1.

The frond is simple, very long (32 cm.) and relatively narrow (5.8 cm.). The midrib is very prominent and persists to the apex which is obtusely rounded. The secondary veins make a wide angle (about 70°) with the midrib; they branch occasionally and there are about 11 of them per cm.

This very large frond is comparable in size with *T. crassinervis* which has been recorded from Mesozoic rocks in Eastern Australia but it is not so wide in proportion to its length, nor are the veins at right angles to the rachis. The other large Australian species, *T. wianamattae*, has veins closer together and is very different in shape from the present species.

In dimensions, *T. triassica* may be compared with *T. Jourdyi* Zeiller from the Rhaetic of Tonkin, but in this the secondary veins are very much more numerous (35 to 50 per cm.), and also with the European species *T. vittata.* Another comparison may be suggested with *Nilssonia taeniopteroides* Halle from the Mesozoic flora of Graham Land (Halle, 1913, p. 47). With regard to this latter comparison, however, further specimens would need to be obtained before the identity of the two could be proved, as it would be necessary to have some evidence of the mode of attachment of the lamina.

Taeniopteris wianamattae (Feistmantel). Plate xxix, fig. 3.
(For synonymy *see* Walkom, 1917, p. 38).

The specimen figured on Plate xxix, fig. 3 appears to be the apical portion of a leaf of *T. wianamattae.* The secondary veins are numerous and make an angle of 60-70° with the midrib.

Cycadophyta.

? Williamsonia sp. (Flowers). Plate xxix, figs. 7-9.

Specimens which are not unlike some of the flowers referred to *Williamsonia* are not uncommon in the Narrabeen Series. As preserved they consist of a series of bracts (5 to 8 in number), petaloid in shape and radially arranged, borne on a stout peduncle. The bracts are 1.5 to 2.5 cm. long, and up to 8 mm. greatest breadth. In the most complete specimen the peduncle is 4 cm. long and 5 mm. wide.

All the specimens are merely impressions and do not show any further detail of the structure. Two of them are figured on Plate xxix, figs. 7, 8. They may be compared with examples described by Wieland from the Jurassic of Mexico (1913, Pl. 27, fig. 6) as *Williamsonia Tlazolteotl.* Associated with the specimens described are some (e.g. Pl. xxix, fig. 9) which show the expanded bracts viewed from above.

Attention may be drawn to the apparent absence of leaves which might be referred to the genus *Williamsonia.* It is probable that such will be found later, in view of the presence of these flowers (?) and of the stems described below.

? Williamsonia sp. (Stems). Plate xxx, figs. 1, 2.

Impressions of stems covered with leaf bases or petioles in spirally arranged series are referred tentatively to *Williamsonia.*

The impressions of the leaf bases are rhomboidal in shape, 6-7 mm. by 4 mm. One specimen has portions of the petioles attached.

These stems may be compared with numerous examples which have been figured by various workers, e.g. *Williamsonia* sp. figured by Berry (after Wieland) from the Liassic of Mexico (Berry, 1918, p. 347, fig. 6c); stems of *Williamsonia*, also from Mexico, figured by Wieland (1913, Pl. 34, 35); fern or cycad stems from the Liassic of Sweden, figured by Antevs (1919, Pl. 6, figs. 36, 41). They may also be compared with such stems as *Bucklandia indica* from the Lower Jurassic of India (Seward, 1917, p. 488, fig. 579).

Williamsonias range from Upper Palaeozoic to Cretaceous.

Ginkgoales.

GINKGOITES sp. Plate xxxi, fig. 1.

The specimen figured on Plate xxxi, fig. 1 represents a fragment of a leaf which may be referred to *Ginkgoites*. There does not appear to be sufficient of the leaf preserved for correct determination, and it is even possible that the fragment represents portion of a large *Baiera* such as *B. Simmondsi* which occurs in the Upper Triassic rocks of the Ipswich Series of Queensland (cf. Walkom, 1917a, Pl. 2).

? RHIPIDOPSIS NARRABEENENSIS, n. sp. Plate xxx, figs. 3, 4.

The two examples figured on Plate xxx, figs. 3 and 4 occur on the same specimen. Fig. 3 shows the leaf divided into a number (7) of wedge-shaped segments, and borne on a petiole. The veins are fine and numerous, about .5 mm. apart.

The habit of the leaf seems to remove it from *Psygmophyllum*, though attention may be drawn to a certain degree of resemblance to *P. Haydeni* which occurs in Permian rocks of India and Russia (see Seward, 1919, pp. 86, 90).

Dun (1910) described leaves from the roof of the coal seam in the Sydney Harbour Colliery (at the very base of the Narrabeen Beds) as *Rhipidopsis ginkgoides* var. *Sussmilchi*, and Seward (1919, p. 85) has suggested that they are probably referable to *Psygmophyllum*, which seems doubtful.

Coniferales.

BRACHYPHYLLUM ANGUSTUM, n. sp. Plate xxx, figs. 5, 6.

Examples of portions of sterile coniferous branches with short narrow obtusely pointed leaves arranged in spirals are referred to *Brachyphyllum*, this generic name being regarded as purely provisional. The branches are thin, the impressions being not more than 3 mm. wide, and the leaves would appear to be up to about 7 mm. long and only 1-2 mm. wide. The specimens may also be compared with sterile branches of *Voltzia* (Seward, 1919, p. 289) which is typically Permian to Lower Triassic and is very similar to *Ullmannia* (Permian) and *Walchia* (Upper Carboniferous-Permian).

? ARAUCARITES SYDNEYENSIS, n. sp. Plate xxxi, fig. 2.

Small cones, up to 3 cm. long and 2 cm. diameter, with cone scales arranged spirally, suggest the reproductive structures of some species of the present day *Araucaria*. They appear to occur abundantly on certain horizons and they resemble the male flowers of *A. excelsa* (Seward and Ford, 1906, p. 326, fig. 10) in appearance and in size. They are quite distinct from any other fossil so far found in Australian Mesozoic rocks.

Seeds.

CARPOLITHUS sp. Plate xxxi, figs. 3-5.

There are a number of oval seeds in the collection. These are up to 1.5 cm. long by 1 cm. broad, but none of them show details of their structure and it does not seem advisable to do more than refer them to *Carpolithus* sp.

Plantae incertae sedis.

A. The three specimens figured (Plate xxxi, figs. 7-9), resemble one another in having a series of lines radiating from a central area. The three, however, apparently represent distinct types. Reference may be made to their general similarity to specimens which have been figured as fruits of Williamsonia. Some of them may be compared with the examples of *Williamsonia pecten* figured by Nathorst (1909, Pl. 2, figs. 16, 17) from the Oolite of Scarborough and with fructifications described by Wieland (1913) as *Williamsonia Netzahualcoyotl* from Mexico.

B. Figure 6, on Plate xxxi is a drawing made by Mr. Leggatt at the same time as most of the others illustrating this paper. I have not seen the original specimen, but it is apparently one which might belong to *Stenorachis* or perhaps to *Beania*.

C. Plate xxxi, figures 10 and 11 represent other fragments which I am unable to determine but which seem worth figuring with the object of drawing attention to them in the hope that further collecting may reveal additional and more complete examples.

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EXPLANATION OF PLATES XXIV-XXXI.

The figures, with the exceptions noted below, were originally drawn, for Mr. W. S. Dun, by Mr. F. R. Leggatt. Some of them have been slightly modified, particularly as regards the venation, under my direction by Mr. P. T. Hammond, of the Geological Survey, who has also prepared the drawings of the following figures:—Plate xxiv, fig. 2; Plate xxix, figs. 10, 11; Plate xxx, figs. 1, 2; Plate xxxi, figs. 8, 9.

Except where otherwise indicated the figures are two-thirds natural size.

Plate xxiv.

Fig. 1.—*Phyllotheca australis* Brongn. Pith cast.

Fig. 2.—*Phyllotheca australis* Brongn. Two nodes showing the character of the leaf-whorl at the upper one.

Fig. 3.—*Phyllotheca australis* Brongn. A nodal diaphragm.

Fig. 4.—*Cladophlebis* sp. Possibly fragment of a fertile frond.

Fig. 5.—? *Cladophlebis* sp.

Figs. 6-8.—*Thinnfeldia Feistmanteli* Johnston. These figures indicate the variation in the type of pinnule.

Fig. 9.—*Thinnfeldia Feistmanteli* Johnston. Portion of a fertile pinna showing the arrangement of the sori.

Plate xxv.

Figs. 1-2.—*Thinnfeldia Feistmanteli* Johnston. Portions of large fronds. The venation is somewhat diagrammatic in figure 1.

Fig. 3.—*Thinnfeldia lancifolia* (Morris). Portion of a typical frond with some seeds (?) superposed.

Plate xxvi.

Figs. 1-3.—*Thinnfeldia lancifolia* (Morris).

Fig. 4.—*Thinnfeldia narrabeenensis* Dun. The venation is somewhat diagrammatic in this figure.

Plate xxvii.

Figs. 1-2.—*Thinnfeldia lancifolia* (Morris).

Fig. 3.—*Thinnfeldia narrabeenensis* Dun. The venation on the lower half of the middle pinnule in this figure is drawn accurately.

Figs. 4-5.—*Thinnfeldia lancifolia* (Morris). The venation in figure 4 is rather diagrammatic.

Fig. 6.—*Thinnfeldia narrabeenensis* Dun.

Plate xxviii.

Figs. 1-4.—*Thinnfeldia narrabeenensis* Dun. Figure 2 shows the basal part of a frond, figures 1 and 3 the apical part.

Plate xxix.

Fig. 1.—*Taeniopteris Tenison-Woodsi* Etheridge Jr. (?).

Fig. 2.—*Taeniopteris crassinervis* Feistmantel.

Fig. 3.—*Taeniopteris wianamattae* (Feistmantel).

Fig. 4.—? *Coniopteris* sp. cf. *lobata* (Oldham).

Fig. 5.—? *Sphenopteris* sp.

Fig. 6.—? *Coniopteris* sp. cf. *lobata* (Oldham).

Figs. 7-9.—? *Williamsonia* sp. Flowers?

Figs. 10-11.—Fern stems (? Osmundaceae). Figure 11 shows one of the leaf bases enlarged.

Plate xxx.

Figs. 1-2.—? *Williamsonia* sp. Stems.
Figs. 3-4.—? *Rhipidopsis narrabeenensis*, n. sp.
Figs. 5-6.—*Brachyphyllum angustum*, n. sp.

Plate xxxi.

Fig. 1.—*Ginkgoites* sp.
Fig. 2.—? *Araucarites sydneyensis*, n. sp. (× 4/3).
Figs. 3-5.—*Carpolithus* sp.
Fig. 6.—Planta incertae sedis. (Possibly *Stenorachis* or *Beania*).
Figs. 7-9.—Plantae incertae sedis.
Figs. 10-11.—Indeterminate plant fragments.
Fig. 12.—*Taeniopteris crassinervis* Feistmantel.